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EDITORIAL

THE WAR AND OUR FOOD

One of the greatest evils of war is the dislocation and chaos which follows in its wake.

Food is essential to life. It can be said with truth that man's primary duty is to search for or find the ways and means of producing food for his family and livestock. Compared with this, all other factors which go to make up the civilised way of life pale into insignificance. It follows, therefore, that agriculture, even in a country which is primarily an industrial one, is the most essential of all industries.

It is not sufficient to produce agricultural products in quantity alone; they must be of first-class quality if the consumer, whether he be man or animal, is to develop to a full and healthy maturity.

In these matters the veterinary surgeon is an important factor, for although his primary interest is in animal life, indirectly his influence extends much further afield, for on the one hand his responsibilities cover the food products of animal origin which are so essential to healthy human life and on the other hand he has a deep concern with rural economy.

In this the sixth year of war the world is faced with an acute food crisis which gives rise to great concern not only to the belligerents but to those in so-called safe areas, some of which are basically agricultural and are thousands of miles from the centre of hostilities. It is natural that we should look to these safe areas to provide the bulk of the necessities of life, for in those countries which are in the maelstrom the more pressing needs of war take first place.

In normal times these safe areas could probably produce all the food the world requires, and, indeed, they would not be slow to take advantage of such a good market.

Why can they not do so now? The answer is simple. Transport, increased consumption and man-power difficulties.

Transport difficulties lead to a surplus at the site of origin. The goods are there, but they cannot reach the market. This sometimes happens even in peace.

The economic reaction is to reduce production and even to destroy stocks, for no industry can live without an economic outlet.

In the early period of a crisis this method has a temporary salutary effect but, taking the long view, it is pregnant with danger. The primary stock may be so reduced that there cannot be a ready reaction to any change in circumstances.

War leads to a great increase in the circulation of money, higher wage levels and spending power of the masses. Greater spending power means increased consumption and demands on an already shortened market. In times of reduction of output man-power is displaced and seeks other avenues of employment, so that when the opportunity and need for an increase in production arises the essential labour is not available. Even if transport and man-power are available, there is a negative phase in efforts to increase agricultural production, for Nature cannot increase its activity with the same alacrity as, say, the engineering or mining industries. You cannot hurry Nature.

These are the circumstances at the present time. Europe is short of food, particularly that of animal origin. It has been said that wars are won on protein, and our chief supplies of protein are meat and milk. At the outbreak of war we in this small island had to decide which of these two essential foods we should try to supply from our own resources. Wisely we concentrated on milk and, owing to the splendid response of our farmers, the milk question has been solved. Almost half of our total meat supplies have come from the Americas, and there are signs that these particular supplies may be much reduced and consequently the available ration cut to such a degree as might have serious effects upon health.

Now in this time of peril a great opportunity arises for our home, Colonial and Dominion producers to step in and seize a market which they have always claimed.

British meat, whether from home or overseas, compares favourably with that from any other source. In the Empire we have the raw material, the experience and knowledge of production, preparation, transport and storage. Veterinary surgeons throughout the Commonwealth can do much to sponsor and encourage this trade, which will have great beneficial effect, not only for our home producers, but for our kinsmen overseas.

General Articles

STUDY OF THE ARTERIAL AND LYMPHATIC SYSTEMS IN THE UDDER OF THE COW—II

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(*Continued from page* 33)

Lymph Vessels of the Udder

Zietschmann stated that there was no other organ equal to the udder in possessing rich and well-built lymph vessels, due to the great metabolic activity of the organ in secreting milk. He classified the lymphatics of the udder into deep and superficial groups. The latter group was further subdivided, according to the regional distribution of the lymph vessels, into those of the cranial sulcus, those of the inter-mammary sulcus, and those of the caudal sulcus. Zietschmann mentioned also that the superficial lymph vessels were finer than the deep lymph vessels and that the former seldom ran into the deep parenchyma. Baum described the lymph vessels of the udder as cutaneous, superficial, and deep or parenchymal merely for convenience in description, but did not imply that these vessels were independent of each other. He mentioned also that the superficial lymph vessels were situated mostly under the skin, and that they reached the corresponding lymph nodes either directly or indirectly by piercing the deep parenchyma, where they followed the deep lymph vessels or communicated with them. In his opinion, there was no characteristic difference between the size of the superficial and deep lymph vessels. In connection with the lymph vessels of the teats, Baum stated that 4-8 vessels arose from the subcutaneous and submucous layers of the nipple and, after ascending in its middle, they became confluent at its base.

It was noted from the examination of the various injected specimens that the development of the lymph vessels varied considerably according to the state of activity of the organ. In those udders which were functioning before being collected, the lymph vessels were well marked and well developed. On the other hand, in non-lactating specimens, the lymph vessels were less visible and very much reduced in size. It was difficult also to find a satisfactory way of classifying the lymph vessels of the udder, as these did not remain independent of each other. For instance, one could not speak of the lymph vessels of the teats, while it was found that these drained other areas of the organ besides the nipple. However, for the purpose of description, it may be convenient to classify the lymph vessels of the udder according to the areas from which their main radicles were derived. With this conception in mind, the lymph vessels of the udder may be described in the following manner:—

(1) The cutaneous lymph vessels, the radicles of which were derived from the lymphatic pelxus in the deeper layer of the skin or dermis.
(2) The superficial parenchymal lymph vessels, the radicles of which were derived from the superficial layer of the parenchyma of the udder.
(3) The deep parenchymal lymph vessels, which received the lymph drainage from the deep parenchyma.
(4) The lymph vessels of the nipples, the main radicles of which sprang from the layers of the teats.

The Cutaneous Lymph Vessels

The lymph vessels carrying out the lymph from the skin were formed by fine radicles which took origin from the lymphatic plexus in the dermis. These radicles united to form larger collecting lymph vessels, which, in turn, united to form the main cutaneous lymph vessels. These latter vessels ultimately reached the superficial supra-mammary lymph node of its own side, but the course pursued in doing so was either a direct or indirect one. (Fig. 5.)

(a) Direct Course

Here the cutaneous lymph vessels proceeded under the skin in company with the superficial parenchymal lymph trunks and those from the nipples, directly

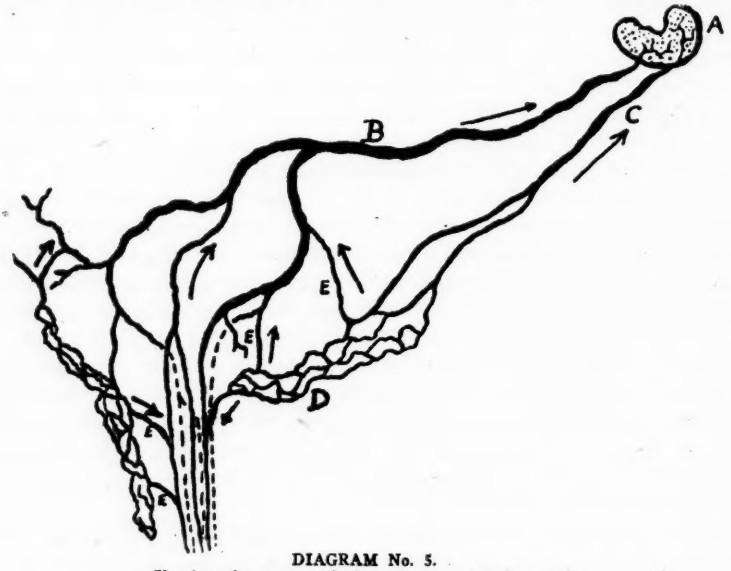

DIAGRAM No. 5.
Showing the course of the cutaneous lymph vessels.
A. Superficial supra-mammary lymph nodes.
B. Lymph trunk of the nipple.
C. Afferent cutaneous lymph vessel.
D. Cutaneous lymphatic plexus.
E. Connection between cutaneous lymph vessels and lymph trunk of nipple.

to the corresponding lymph node. In a few cases, a cutaneous lymph vessel, in the latter part of its course, passed deeply into the parenchyma and then appeared superficially again before, or as it entered, the lymph node.

(b) Indirect Course

Some of the collecting lymph vessels joined either the radicles of the lymph trunks of the nipples in particular or the superficial parenchymal lymph trunks, especially in the regions of the lactiferous sinuses. In this manner, the lymph drainage from the skin indirectly reached the corresponding lymph node through these previously-mentioned lymph trunks. Because of this anatomical arrangement, one is inclined to consider a greater chance of the spread of an infection from a contaminated lesion of the skin in these areas than in any other part of the udder. In addition, from the peculiar disposition of the superficial lymph vessels in these regions, shortly to be described, these areas may be regarded as dangerous lymphatic areas of the udder.

The Superficial Parenchymal Lymph Vessels

The main radicles of these vessels were derived from the superficial parenchyma of the udder, but a few sprang from the regions of the nipples. The lymph trunks formed by the union of these radicles varied in number. In most of the specimens examined, 2-3, occasionally 4, lymph trunks accompanied those of the posterior nipple. These lymph vessels were concerned with the lymph drainage of the posterior quarter and their radicles took origin from the superficial parenchyma over an area caudal to the base of the posterior nipple, and extending as far as the caudal sulcus caudally and the inter-mammary sulcus ventrally. However, some of the radicles of the most cranially situated lymph trunk proceeded from the posterior nipple. The anterior quarter was similarly provided with 1-2, occasionally 3, lymph vessels, which accompanied more or less the lymph trunks of the anterior nipple. The radicles of these lymph trunks took origin from the superficial parenchyma of the dorso-lateral part of the anterior quarter as far as the cranial sulcus cranially. The remaining part of the anterior quarter was drained by other vessels, which constituted some of the radicles of the lymph trunks of the anterior nipple. (Fig. 4.) In lactating udders, the superficial parenchymal lymph trunks were of a large size, varying from 3-6 mm. in diameter. These lymph vessels, especially in former cases, could be traced easily along the greater part of their course under the skin without having been injected. The injection, however, was essential in order to examine the origin of their finer radicles. All lymph vessels of the udder were provided with numerous valves, which gave them a conspicuous beaded appearance along the whole of their course, especially when these were thoroughly injected. These valves were situated at a variable distance of $\frac{1}{4}$ to $\frac{3}{4}$ in. from each other. They could stand a pressure of 400-500 mm. of Hg., as was shown when an attempt was made in inject them in a retrograde manner against the flow of the lymph. Generally speaking, the lymph trunks proceeded in pairs and parallel to each other either superficially or deeply. Not infrequently, some of these lymph trunks divided into two smaller vessels during their course and, after running for a short distance, united before or just as they entered the lymph node, thus increasing the lymphatic bed, as it were. The superficial parenchymal lymph vessels lay in the greater part of their course either between the layers of the fasciæ of the udder or deep to the deep fascia. The radicles of these were disposed in several layers and more numerous in the posterior quarter than in the anterior quarter. All superficial parenchymal lymph vessels, with no exceptions, entered the superficial supra-mammary lymph node. In addition to these lymph trunks already described, there were a number of very fine lymph vessels, about $\frac{1}{2}$ to 1 mm. in diameter, situated under the deep fascia in intimate relation to the parenchyma of the organ. These vessels possessed a thicker wall, similar to that of the smaller blood vessels. Although these lymph vessels, strictly speaking, derived their radicles from the superficial parenchyma in the region of the lactiferous sinuses in particular, they joined the lymph vessels of the nipples at various levels.

The Deep Parenchymal Lymph Vessels

The lymph from the central part of the udder is carried out by a variable number of deep lymph vessels, which varied in size in the different specimens examined. These were much smaller in size, usually 2-4 mm. in diameter, contrary to the statement of Zietschmann that the superficial lymph vessels

were finer than the deep vessels. The radicles of the deep lymph vessels closely followed the fine branches of the mammary artery and their venoe comitantes. These radicles united to form the deep lymph trunks, which closely followed the main branches of the mammary vessels. Some of these lymph vessels united before they entered the deep supra-mammary lymph nodes of their own side. Very occasionally one or two deep lymph vessels of one side crossed the median plane and entered the corresponding lymph nodes of the opposite side. (Fig. 1.) This was seen in one specimen where the lymph vessel accompanying the lateral dorsal terminal branch of the common basal artery of the left side entered the deep supra-mammary lymph node on the right side. Other small lymph vessels from the parenchyma in the neighbourhood of the lymph nodes of the left

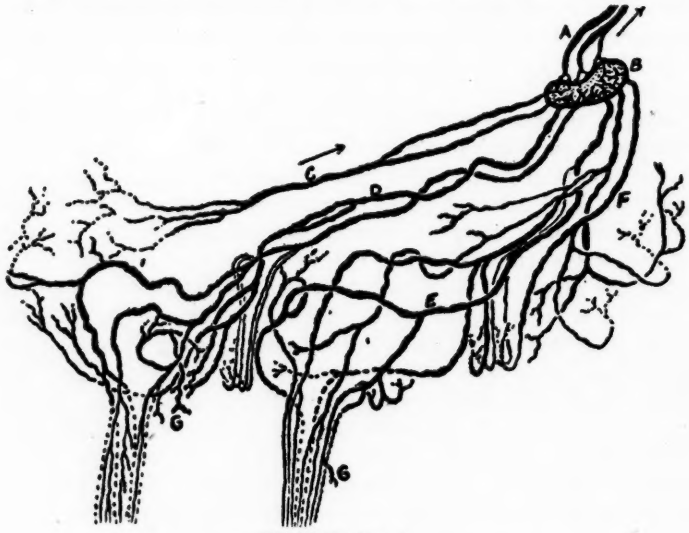

DIAGRAM No. 6.
Distribution of the superficial lymph vessels of the left side.
A. Main efferent lymph trunks.
B. Superficial supra-mammary lymph node.
C. Superficial parenchymal lymph vessel of anterior quarter.
D. Afferent lymph vessels of anterior nipple.
E. Afferent lymph vessels of posterior nipple.
F. Superficial parenchymal lymph vessels of posterior quarter.
G. Cutaneous lymph vessels.
H. Lymphatic plexuses of nipples.

side followed the same course. In three specimens only, a lymph trunk, 2-4 mm. in diameter, was found taking a different course from that of the other deep lymph vessels, and which necessitated a separate description.

The radicles of this lymph vessel took origin from the interior of the ventral part of the left anterior lactiferous sinus. These radicles united on the outer surface of this region, caudal to the associated anterior nipple forming the main lymph vessel. The latter vessel proceeded in a caudal and medial direction, reaching the cranial part of the inter-mammary sulcus. In this region it disappeared between the lateral surface of the median septum and the medial surface of the anterior left quarter, partly embedded in the parenchyma at some parts. The vessel, continuing its course dorsally and caudally, reached the base of the udder at a variable distance from the middle of the latter in the median plane. From this point, the lymph vessel crossed the base of the organ in a lateral and caudal direction, entering the deep supra-mammary lymph node of

its own side. A notable feature of this vessel was the very tortuous manner in which it was disposed along the whole of its course. (Photograph No. 1.) It may be convenient to refer to this lymph vessel as the subseptal parenchymal lymph vessel in accordance with its course and origin. This lymph vessel did not receive any other radicles from any part of the udder along its course. Thus, it seemed to be concerned with the lymph drainage from the ventral part of the lactiferous sinus from which it took its origin.

The Lymph Vessels of the Nipples

The nipples are very rich both in blood and lymph vessels. Each teat possessed 2-3 lymph trunks, which were slightly larger than the preceding superficial parenchymal lymph trunks. These vessels varied in size from 5-7 mm. in

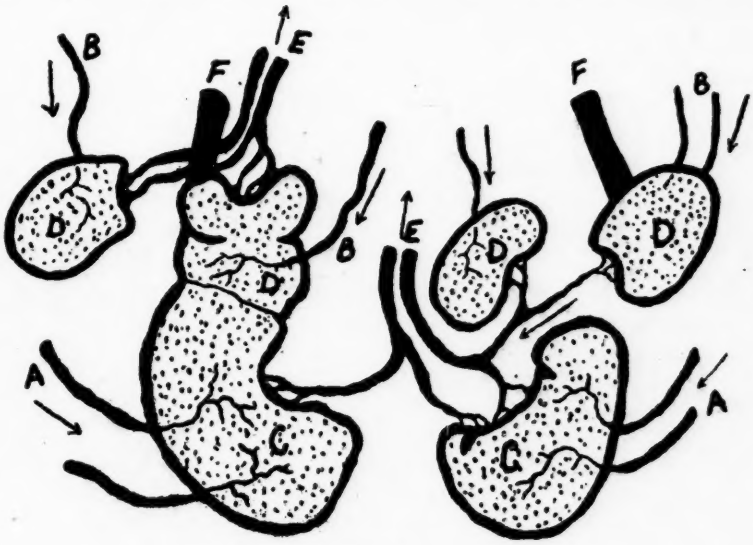

DIAGRAM No. 7.
Showing independent flow of lymph from each lymph node.
A. Superficial parenchymal lymph vessels.
B. Deep parenchymal lymph vessels.
C. Superficial supra-mammary lymph nodes.
D. Deep supra-mammary lymph nodes.
E. Main efferent lymph trunks.
F. Mammary arteries.

a previously lactating udder. The lymph trunks of each nipple had no connection with either those of the other nipple on the same side or those of the corresponding nipple on the opposite side. Where supernumerary teats were present, they had also their own lymph vessels, which remained independent of those of the associated normal ones. These lymph trunks shared all the features of the superficial parenchymal lymph vessels. However, they pursued a very tortuous course, especially at the base of the teats. In this latter region also they were freely movable under the skin, being attached only to the superficial fascia by a certain amount of delicate areolar tissue. Their radicles were derived both from the subcutaneous and submucous layers of the teats. The main radicles were disposed parallel to the long axis of the teat, but the finer radicles were obliquely situated, connecting the main radicles together and thus forming a rich lymph plexus. (Fig. 6.) Two lymph plexuses could be differentiated: a subcutaneous or sub-areolar plexus, situated under the skin

and which received also some of the cutaneous lymph vessels, as already mentioned; and a deep or submucosal plexus, some of the radicles of which entered the deep parenchyma to join the deep parenchymal lymph vessels. Although two separate lymph plexuses were described, according to their respective position in relation to the layers of the teat, these did unite with each other. Thus, it was evident that while the greater part of the lymph from the nipple was carried away by its own lymph trunks, part was carried out by the deep lymph vessels of the parenchyma via the radicles from the submucosal plexus which entered the deep parenchyma. By the union of these radicles at the base of the nipple, the main lymph vessels were formed. Here, the latter vessels pursued a very tortuous course and were disposed in one way or the other, forming an almost complete circle.

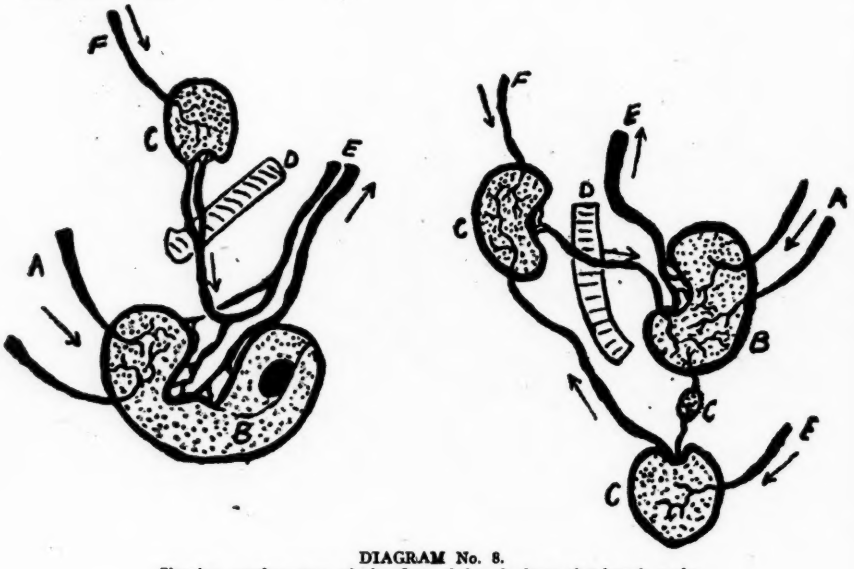

DIAGRAM No. 8.
Showing another type of the flow of lymph from the lymph nodes.
A. Superficial parenchymal lymph vessels.
B. Superficial supra-mammary lymph nodes.
C. Deep supra-mammary lymph nodes.
D. Mammary arteries.
E. Main efferent lymph trunks.
F. Deep parenchymal lymph vessels.

In the region of the lactiferous sinuses, these lymph vessels received several radicles from the superficial parenchyma of these regions, thus increasing the size of these vessels. The lymph trunks thus formed continued their course caudally and dorsally on the lateral surface of the udder, mostly between the layers of the fasciæ of the organ. In fat animals these lymph trunks were well protected by an appreciable amount of fat, while in lean subjects fat was scanty. The tortuous course of these lymph vessels and their free mobility under the skin at the base of the nipples may be a safeguard against the sustained stretching which occurs during suckling, milking, or even when the gland is at extreme activity.

The surface marking of the position of the lymph trunks of the nipple and superficial parenchymal lymph trunks may be indicated in the living subject as corresponding to an area immediately dorsal and ventral to a line drawn midway between the bases of two nipples of the same side to a point on the

PHOTOGRAPH No. 1.

Showing subseptal parenchymal lymph trunk.

A. Left anterior nipple.
B. Subseptal parenchymal lymph trunk.
C. Deep supra-mammary lymph node.
D. Superficial supra-mammary lymph node.
E. Mammary artery.
F. Medial aspect of left anterior quarter.

different picture from what was previously mentioned. In these cases, the state of any of the deep nodes obviously would not affect the superficial supra-mammary lymph node. On the other hand, an infection of the latter node either results in the involvement of one or more of the deep lymph nodes, or not at all.

The Lymph Drainage from the Udder

From the previous survey of the description of the anatomical distribution of the lymphatics of the udder it has been seen that there was complete independence of the lymph vessels of one side from those of the other, except in very occasional cases, where some of the deep lymph vessels crossed to the other side. Thus, one expected to find the same relation existing between the ultimate lymph drainage of either side. Baum stated that occasionally some of the lymph vessels of either side may enter the supra-mammary lymph node of

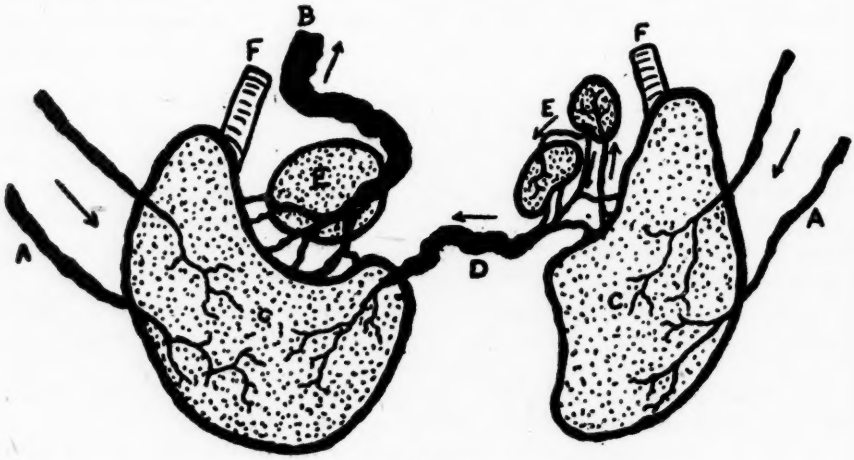

DIAGRAM No. 9.

Showing totally indirect type of lymph drainage.

A. Superficial parenchymal lymph vessels.
B. Left main efferent lymph trunk.
C. Superficial supra-mammary lymph nodes.
D. Right main efferent lymph trunk.
E. Deep supra-mammary lymph nodes.
F. Mammary arteries.

the opposite side, or even the deep inguinal lymph node of that side. However, he did not give any further information on the manner in which this might take place. On further investigation of this matter, it was possible to confirm Baum's statement and to obtain further significant facts from the results obtained. In addition, it became also possible to extend this statement to include the fact that the entire lymph drainage of one side occasionally drained with that of the other side. Now the whole subject will be discussed in the order occurring most frequently.

1. The Direct Lymph Drainage

In about 77 per cent. of the specimens examined, the lymph from either side of the organ left the lymph nodes of its own side by 1-2 lymph trunks, which accompanied the mammary vessels of that side to their final destination. Thus, the lymph drainage of each side remained independent from that of the other side. (Fig. 8.)

2. The Indirect Lymph Drainage

In about 23 per cent. of the specimens examined, the lymph from either side of the udder or from one side only, joined the lymph drainage from the other side. This, however, took place in reciprocal, unilateral or totally indirect manner.

(a) The Reciprocal Exchange of Lymph

By using a polychrome double injection for the group of lymph nodes on either side of the udder, it was found that these injections, besides filling the main efferent lymph trunks of their own side, crossed the median plane and filled some of the lymph radicles or the efferent lymph trunk of the other side. In three injected specimens, dissection revealed the following :—

(1) In one specimen, the deep and superficial supra-mammary lymph nodes of either side were fused together in a single mass.

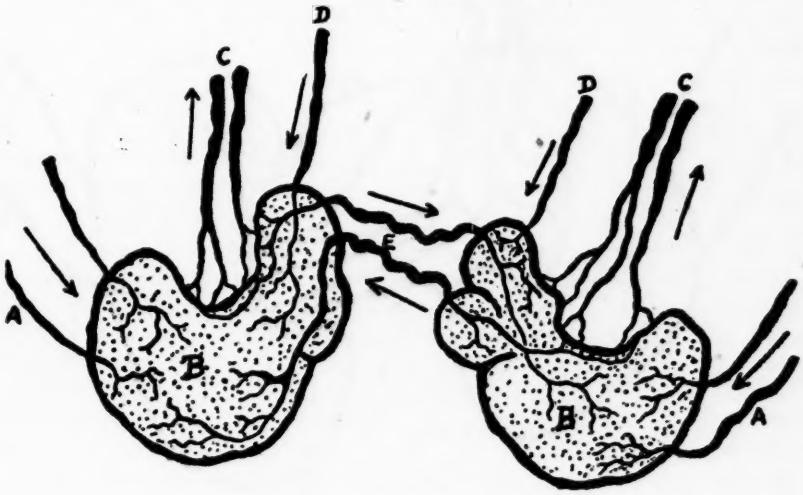

DIAGRAM No. 10.

Showing reciprocal type of lymph drainage.

A. Superficial parenchymal lymph vessels.
B. Superficial supra-mammary lymph nodes fused with the deep lymph nodes.
C. Main efferent lymph trunks.
D. Deep parenchymal lymph vessels.
E. Efferent vessel from nodes of either side to other side.

(2) In another specimen, the superficial supra-mammary lymph nodes only were present.

In both cases it was revealed that the communication evidenced by the flow of the injection material was effected through an efferent lymph vessel, 3-5 mm. in diameter from one lymph node to the other. (Fig. 10 and Photograph No. 2.)

(3) In the remaining specimen, there were present both the superficial and deep supra-mammaries on either side of the udder. The superficial supra-mammary lymph nodes were also connected by a narrow isthmus of lymphoid tissue across the median plane. In this specimen the connection was effected by several lymph vessels from the lymph nodes of either side and crossed to join the main efferent lymph trunk of the opposite side. (Fig. 2.)

Accordingly in these specimens, the lymph drainage from either side was

partly carried away by the efferent lymph trunk of its own side, and partly by the corresponding trunk of the opposite side. Although this was the final result of the lymph drainage in these three cases, the course of the spread of an infection would, however, be different in (1) and (2) from that in (3). In the former cases (1) and (2), the communicating vessel left the hilum of one lymph node and entered the capsule of the other. Thus infection of one lymph node would finally reach the other node of the opposite side, provided again that such infection is allowed to proceed unhindered. In these cases, the morbid changes in the lymph nodes of both sides would not necessarily mean the affection of the whole organ. Thus, total condemnation of the udder should be decided by the clinical examination of the lymph nodes of both sides in conjunction with

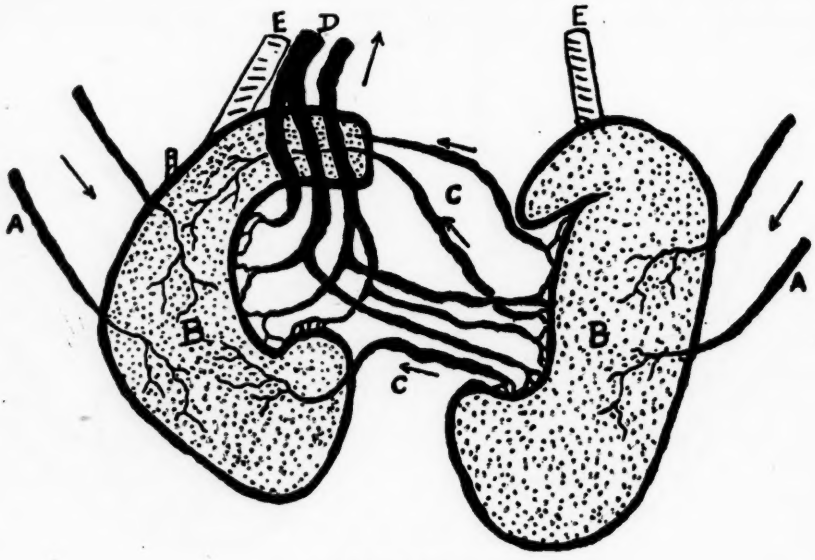

DIAGRAM No. 11

Showing totally indirect type of lymph drainage.

A. Superficial parenchymal lymph vessels.
B. Superficial supra-mammary lymph nodes.
C. Efferent lymph vessels entering capsule of left lymph node.
D. Main efferent lymph trunks.
E. Mammary arteries.

that of the parenchyma of the organ. On the other hand, in (3) the communicating vessels from the lymph nodes of one side did not enter the lymph nodes of the opposite side, but simply became incorporated with the efferent lymph trunk of that side. Therefore an infection of the lymph nodes of either side would only affect the pre-pelvic lymph nodes of the opposite side.

(b) The Unilateral Lymph Drainage

In this type, the lymph from one side only, drained partly by its own efferent lymph trunk and partly by crossing to the other side and joining the efferent lymph trunk of that side. This was found to take place from the right to the left side of the udder more frequently than in the opposite direction. This mode of the flow of the lymph was seen in 50 per cent. of the specimens where the indirect route was encountered. (Fig. 11.)

XUM

(c) The Total Lymph Drainage

It was shown in previous instances (*a*) and (*b*) that both reciprocal and unilateral indirect flow of the lymph took place from either one or both sides of the udder. However, in the type under consideration, the lymph drainage from one side was totally carried away by the efferent lymph trunk of the opposite side. This was seen in two specimens only, in which the lymph leaving the lymph nodes of the right side crossed to the left side and joined the lymph drainage of that side. In other words, the whole lymph from the organ was carried away by the efferent lymph trunk or trunks of the left side. Because of the different manner in which this took place in these two specimens, it was necessary to describe each case separately.

(1) In one specimen, the superficial supra-mammary nodes only were present. The left efferent lymph trunks were formed by the union of several radicles derived from both lymph nodes. (Fig. 11.) In addition, three efferent lymph vessels from the right lymph node entered the capsule of the lymph node of the opposite side. In this arrangement, part of the lymph drainage from the right side passed through the lymph node of the left side, and part was carried away by the left efferent lymph trunks. Therefore an infection of the left lymph node would not affect that of the right side. Should, however, infection exist in the right lymph node, it would be difficult to say whether or not the left lymph node would become involved. It is, however, safer to consider that such a possibility exists.

(2) In the other specimen there were three lymph nodes present on the right side, from which separate efferent lymph vessels united to form a common efferent lymph vessel. This latter vessel crossed to the left and entered the capsule of the superficial supra-mammary node of that side. (Fig. 9.) From this latter node, the main efferent lymph trunk draining the whole udder was derived. Therefore, in this specimen the whole lymph drainage from the right side had to pass through the superficial supra-mammary lymph node of the left side, and not only part as in the previous case. The result of the spread of an infection from any of the nodes would be fundamentally the same as in the previous specimen, with the important difference that infection of the right lymph nodes would affect, in every case, the left lymph node.

It was also of interest to find such anatomical provision for the lymph from the right side of the udder to pass either entirely or partly, as seen in the previous two cases, through the left lymph node and not directly to the pre-pelvic nodes of that side.

In conclusion, it is not possible to lay down any hard and fast rule regarding the sequelæ of an infection reaching either one individual lymph node or an entire group of lymph nodes of either side. The facts already mentioned (*vide supra*) may be taken as a guide in affording an explanation of the possible course of such infection when it does occur.

The Final Destination of the Lymph

The lymph drainage from the udder was ultimately carried away by 1-2 efferent lymph trunks formed in any one of the various manners previously mentioned, and closely followed the mammary vessels in the inguinal canal to the pelvic region. In the injected carcase, the course of these efferent lymph trunks was followed in the abdomen to their final destination. These efferent lymph trunks usually lay between the mammary artery and its vena comitant.

XUM

At a variable distance along the course of the mammary artery in the abdomen, the lymph trunks receded from the mammary vessels and entered a caudally situated small lymph node on the medial side of the deep femoral artery, close to the origin of the pudendo-epigastric trunk.

From this lymph node, an efferent lymph vessel proceeded cranially, closely following the deep femoral artery, the pudendo-epigastric trunk, and then the external iliac artery to a point just caudal to the origin of the circumflex iliac artery. Here the efferent lymph trunk divided into two smaller lymph vessels which crossed the external iliac artery entering the deep inguinal lymph node, this node occupying the space between the circumflex and external iliac arteries. (Fig. 12.) According to Sisson, the deep inguinal lymph node has been described by Chauveau-Lesbre as the external iliac lymph node, but according to the

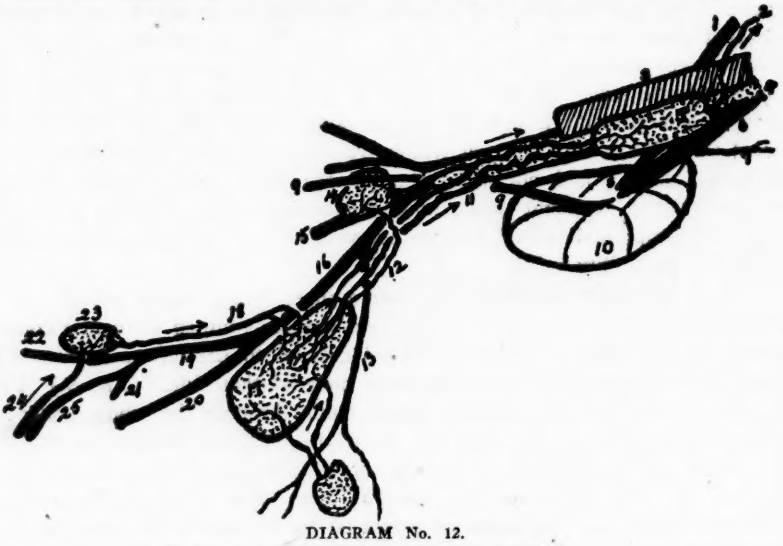

DIAGRAM No. 12.

The course of the lymph drainage from the udder.

1. Right renal artery.
2. Efferent lymph vessel to cisterna chyli.
3. Posterior vena-cava.
4. Abdominal aorta.
5. Main lumbar lymph node.
6. Left renal artery.
7. Branch to supra-renal gland.
8. Left renal vein.
9. Left ureter.
10. Left kidney.
11. Efferent lymph vessels to main lumbar lymph node.
12. Efferent lymph vessel to left internal iliac lymph node.
13. Circumflex iliac artery.
14. Left internal iliac lymph node.
15. Internal iliac artery (hypogastric).
16. External iliac artery.
17. Left deep inguinal lymph node.
18. Efferent lymph vessel to left deep inguinal.
19. Common trunk of deep femoral artery and pudendogastric trunk.
20. Femoral artery.
21. Caudal epigastric artery.
22. Deep femoral artery.
23. Lymph node on deep femoral artery.
24. Efferent lymph trunk from left lymph nodes of udder.
25. External pudendal artery.
26. External iliac lymph node.

observations of Baum this node, together with the deep femoral lymph node, derives its afferent lymph vessels from substantially the same regions as the deep inguinal in the horse; and thus Baum describes it as the deep inguinal. From this latter node three efferent lymph vessels were seen to leave its cranially-situated hilum. One of these vessels, after crossing the origin of the circumflex iliac artery, entered the internal iliac lymph node situated at the termination of the abdominal aorta and the union of the radicles of the posterior vena cava. The remaining two lymph vessels continued cranially on the ventral surface of the abdominal aorta and vena cava and, after uniting with the efferent lymph vessels from the opposite side and from the internal iliac lymph nodes, entered

the lumbar or aortic lymph node. This latter node was situated on the ventral surface of the abdominal aorta and vena cava in the lumbar region, opposite the cranial pole of the left kidney. The efferent lymph vessel leaving the lumbar lymph node crossed to the right between the posterior aorta dorsally and vena cava ventrally, where it appeared slightly in front of the right renal artery.

This lymph trunk formed one of the main radicles of the cisterna chyli. Therefore, the lymph drainage from the udder ultimately reached the deep inguinal lymph nodes, and from these nodes partly reached the internal iliac lymph nodes and partly passed directly to the lumbar lymph nodes.

Baum found in one out of fifteen cases a superficial lymph vessel entering the pre-femoral (subiliac) lymph node, but he did not mention whether this vessel originated from the skin or the lymph nodes of the udder. In this respect it was found in only one specimen of all the udders examined that an efferent lymph vessel left the superficial supra-mammary lymph node of either side of the udder, and proceeded independently from the main efferent lymph trunk of its own side. These lymph vessels closely followed the lateral border of the base of the organ, proceeding in a cranial direction to a point slightly caudal to the middle of this border. It was not possible, however, to follow their course any further, as the udder was collected from one of the dead animals.

Although it is possible to state that the previously-mentioned lymph vessels originated as efferent vessels from the lymph nodes of the udder, and not from the skin, it is only suggestive from their course that the lymph vessels reach the pre-femoral lymph nodes.

Summary

An account of the lymph nodes of the udder and their classification into superficial and deep groups has been attempted.

The anatomical distribution, classification and relation of the lymph vessels to each other are discussed.

First-hand information on the path of the lymph between the individual lymph nodes of the udder has been obtained, and the significance attached to the various routes encountered appreciated.

First-hand information on the lymph drainage from either side of the udder indicated this lymph drainage occurred either in a direct or an indirect manner.

The indirect type of lymph drainage was found to occur in a reciprocal, unilateral or totally indirect manner.

The possible path of an infection from either an individual lymph node or a group of lymph nodes of either side is discussed in the light of the various modes of lymph drainage encountered.

The lymph drainage from the udder was found to reach ultimately the deep inguinal lymph nodes. From these, it partly reached the internal iliacs and partly passed directly to the lumbar lymph nodes.

A new modification of Jamieson and Dobson's method for injecting the lymphatics and its application to injecting the lymphatics of the udder is described.

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(To be continued)

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EXPERIMENTS TO ASCERTAIN THE EFFECT OF CERTAIN CHEMICAL SOLUTIONS ON ANTHRAX SPORES

By J. K. H. WILDE,
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THE object of the following experiments was to find an agent which could be used economically in Tanganyika Territory for the disinfection of hides against anthrax. If such an agent is forthcoming, it might be used at certain centres where hides for export are collected.

Experiment I

A virulent strain of *Bacillus anthracis* was obtained from Kabete. This had been isolated from a fatal case occurring at Onderi. The organism was sub-inoculated on to Lemco Agar slopes and on incubation grew profusely. Examinations of smears of these cultures showed a high proportion of spores.

Six small strips of hide, attached by stiff wire to corks, and contained in test tubes, were sterilised in the autoclave at a pressure of 30 lb. per square inch for forty minutes.

One of the growths of anthrax bacillus was washed off with normal saline and the strips of sterile hide were soaked in the resultant suspension for about five minutes and then were returned to their sterile tubes. They were allowed to dry for 24 hours to ensure that sporulation of *B. anthracis* would take place.

The strips of hide, numbered A, B, C and D, were then submerged in a solution of sodium fluo-silicate with acetic acid (1 per cent. sodium fluo-silicate and 0.2 per cent. acetic acid) as follows:—

A. Hide covered with hot solution for ½ hour.
B. Hide covered with cold solution for ½ hour.
C. Hide covered with cold solution for 1 hour.
D. Hide covered with cold solution for 20 hours.

Stripe E was submerged in a 5 per cent. lysol solution for one hour, and F was left untreated as a control. When removed from the solution, the strips of hide were washed individually in normal saline and the control strip was treated similarly. The resultant washings were then used as inocula for agar slopes, each slope receiving about five loopfuls of the washings.

The slopes were then incubated, and after 24 hours at 37 degrees C. each showed a copious growth of *B. anthracis*.

Sodium fluo-silicate in a solution of 1 per cent. strength and in the presence of a trace of acetic acid was therefore considered useless as a disinfectant for hides should anthrax organisms be present as a contaminant.

Experiment II

Three cultures* of *B. anthracis* were exposed to the following agents respectively:—

(a) Sodium fluoride (2 per cent. solution) together with acetic acid (0.2 per cent. solution) for 20 hours.
(b) 20 per cent. Lysol solution for ½ hour.
(c) 5 per cent. formalin solution for ½ hour.

At the end of the exposure, sub-inoculations were made on to agar slopes from the bacterial material left after pouring off the fluid under test. Copious

* All the cultures used were found to contain a high proportion of spores before the tests were carried out.

growths occurred on the slopes inoculated from tubes (a) and (b), i.e.: sodium fluoride and Lysol, but no growth appeared as a result of inoculation from tube (c), i.e.: formalin, even after 48 hours' incubation.

Thus it appears that 5 per cent. formalin allowed to act for ½ hour will kill anthrax spores, whereas a 2 per cent. solution of sodium fluoride in the presence of acetic acid allowed to act for 20 hours and a 20 per cent. solution of Lysol allowed to act for ½ hour are ineffective.

Experiment III

Three tubes containing cultures* of *B. anthracis* were subjected to the following test:—

(a) One culture was exposed to a 1 per cent. solution of sodium nitrite with a trace of acetic acid for ½ hour. Subsequent sub-inoculation produced copious growths of the bacillus.

(b) A second culture was exposed to a similar solution for one hour. This treatment also proved ineffective in killing the bacillus.

(c) A third tube was exposed to a 5 per cent. solution of sodium nitrite containing a trace of acetic acid, the exposure being extended to three hours' duration. Sub-inoculations from this culture produced no growths of *B. anthracis* after 24 hours' incubation, but by 48 hours one colony had appeared.

Thus, 1 per cent. sodium nitrite solution in the presence of acetic acid does not kill the spores of *B. anthracis* when the latter are exposed to it for up to one hour. A 5 per cent. solution of sodium nitrite will kill a large number of anthrax spores when allowed to act for three hours, but does not necessarily kill all of them.

Experiment IV

The same experiment was carried out again, using a 2 per cent. solution of sodium nitrite containing a trace of acetic acid, the exposure being for three hours. This also failed to kill the spores, copious growth of *B. anthracis* being obtained on sub-inoculation.

Discussion

Of all the solutions tested in this series of experiments, only two showed any marked capacity for the killing of anthrax spores. These solutions were:—

(a) 5 per cent. formalin solution.

(b) 5 per cent. sodium nitrite solution plus a trace of acetic acid.

The formalin solution proved most effective and as far as the experiment went was completely so, killing all the anthrax spores which were sub-inoculated.

(In the official report, the economical side of the possible use of hide disinfectants as affecting Tanganyika Territory is discussed, but it is thought that this will not be of interest to home readers. The following conclusion is therefore reached.)

Conclusion

No evidence is produced by the above experiments to recommend any of the substances tried for general use as agents of disinfection in hide production.

I wish to record my thanks to the Director of Veterinary Services, Tanganyika Territory, for permission to publish this report.

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Clinical Article

OBSERVATIONS ON THE CONDITIONS RELATING TO THE SALE OF THOROUGHBRED HORSES AT PUBLIC AUCTIONS

By MAJOR F. B. SNEYD, M.R.C.V.S.,
Sparsholt

THE matter of horses, two-year-old and upwards, who are monorchids, or more commonly known as cryptorchids, sold at bloodstock sales of the very highest repute as COLTS, is a subject of much importance to the veterinary profession, and to trainers and owners.

What has brought this matter again to my notice was an experience at the recent Newmarket December Sales. I was interested in a two-year-old colt on behalf of a new patron of my stable. The colt had some form and was bound to fetch a fair price. On the morning of the sale I went to his training stable to look at the horse—as is my usual custom when interested in a two-year-old or upwards. I looked to see if both testicles were down. It was a bitterly cold day and my first impression was that only one testicle was down, but I was assured by the man in charge of the horse that both were down all right. With this assurance, coupled with the very cold day, when a horse often does carry one testicle rather high, I accepted the statement that the horse was all right—although the doubt still existed in my mind. I no doubt wanted to believe that all was well, for I had picked out the colt on his breeding and performance as suitable for this new patron of mine, and when I saw the horse I liked him very much and wanted to buy him—which I did for £800. On my return home—the horse having arrived at my stables a few days ahead of me—almost the first thing I did was to examine him, when I was left in no doubt but that the horse had only one testicle down—in other words he was a monorchid—or as it is more commonly called, a cryptorchid. I asked W. J. Bambridge, M.R.C.V.S., of Lambourne, to see the colt, and he confirmed my diagnosis, and also he was of the opinion that he could locate the testicle in the abdominal entrance to the inguinal canal. My owner and I had decided on castration at the time of purchase, and in spite of the increased risks of operation I strongly advised proceeding with the operation. I sent the horse back to Newmarket to Mr. E. Brayley Reynolds, who operated successfully and, incidentally, located the testicle in the position diagnosed by Mr. Bambridge. The horse is now back with me and is thriving. I am more than pleased that I purchased this horse, so that you will see that I have not put pen to paper in the spirit of one who has been stung.

Now there have been some very good race-horses with only one testicle down. I trained one very useful horse myself—by name Troubadour—whom I bought from Lord Derby as a two-year-old for £70 at Chepstow after he ran third in a poor-class selling race. Later that year he won the Ditch Mile Nursery at Newmarket and the following year the Prince Edward Handicap at Manchester and the Newbury Autumn Cup—stakes to the value of over £3,000.

It is the experience of most knowledgeable trainers (who have noticed that the horse they train is a monorchid, and not all do by a very long way) that a horse with only one testicle down is, in most cases, an unreliable race-horse. He may have, and frequently does have, racing ability, but he is not consistent.

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Frequently, whilst running a good race, he seems to just lack putting in that extra dash at the last half-furlong—which makes all the difference to the winning or losing of a race. These horses are invariably called "dog horses," "ungenerous horses," etc., and no doubt usually run in blinkers, which in their case does no good.

As a matter of interest—as it is rather more than a coincidence—I trained two other horses by the same sire as sired Troubadour, and they were both monorchids. One was a very useful horse at home, but quite useless on a race-course. I had him operated on by the late Professor Hobday. The following season he again worked well at home, and first time out he won a 1½-mile race at Lingfield in very good style. He ran well in his next race, but he never won again and eventually he became useless.

The other horse in question was a good horse at home—he kept on running well, was placed at Ascot, was second, beaten by a short head, at Goodwood, third in a Liverpool Cup and placed in many other races—but I could not win a race with him and eventually he also became useless.

A very experienced veterinary surgeon who does a great deal of operating work in the racing world tells me that he has found that when he operates on a monorchid who has been in training he frequently finds that the retained testicle is in a bruised condition and that there are invariably adhesions where this bruising exists. These adhesions, I have little doubt, are the reasons why, when the horse in his race is asked for his supreme effort, he fails to give it, not because he is a dog of a horse or ungenerous or lacking in courage, but because of pain—probably very great pain—brought on at the end of a hard race and at the moment when he is being asked to give his last ounce.

Invariably the veterinary surgeon is not asked to operate on these horses until their racing performances are unsatisfactory.

At these bloodstock sales it is not always possible to make as thorough an examination of your prospective purchase as I was able to make in the case I have referred to. Frequently, through lack of time, as one may have to be present at the sale ring on other business, the examination of a horse in training is left until his arrival in the sale paddock. The horse may only arrive a very short while before he is due to come up, so the examination has to take place by asking the attendant to draw his horse into the centre of a ring of horses. The horse is fidgety and restless to rejoin the ring of horses which are walking round, and a horse under these conditions will seldom or ever stand still long enough to permit your hand getting anywhere near his scrotum. In actual fact, even under ideal conditions, many horses when examined in the quietness of their own stable resent scrotal examination. Almost the most one can hope for in this examination in the open with horses on the move all around is to satisfy yourself that his fore legs are all right. When buying a horse in training with recent good form one is naturally inclined to be satisfied with this knowledge. The point I now come to is this: "Is an auctioneer entitled to print on his catalogue that a certain horse is a colt when the said animal is a monorchid?" I suggest that he is not.

When horses are sold at the bloodstock sales there is no warranty as to soundness in any shape or form. You buy on breeding, looks and form. The soundness side you find out as best you can, but I suggest the animal must be described completely accurately as to its sex. This now brings me back to the early part of this subject and how it may affect the veterinary practitioner. I

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suggest that it should be obligatory on the auctioneer when he accepts an entry for his sale that a veterinary certificate as to the sex accompanies the entry for all uncastrated males of the age of two years and upwards. I omit yearlings, for they are too young to definitely say that they are monorchids.

Of course, it may be that a legal opinion might have to be taken on this matter—although through ignorance of the subject this opinion might not be worth the paper it was written on—but I have little doubt that an action against an auctioneer for selling a monorchid as a colt would succeed, or alternatively if the purchaser returned the horse when he found out what he had bought the auctioneer would not be able to make him pay the purchase price.

An Appreciation

PROFESSOR GEORGE W. CLOUGH, D.Sc.

Dr. George W. Clough, Professor of Chemistry at the Royal Veterinary College, died on Sunday, February 20, 1944. Dr. Clough was the occupant of a post which ever since 1839, when William John Thomas Morton was appointed on the foundation of the chair, has been occupied by men of renown. The chair in chemistry was the second professorship to be instituted in the College. So at a very early date in the history of the College the Governors recognised the great importance of chemistry in the veterinary educational curriculum, and from time to time they have demonstrated that the subject was to be considered one of prime importance by their choice when selecting successors to the chair. Clough's name will always rank high in the distinguished list.

It is meet that such a man should have a permanent record of his life and work in the annals of veterinary history albeit almost a year has passed since his death. I regret the delay in the publication of this note and excuse myself by the statement that great difficulty has been encountered in the search for information for a considerable period of Clough's life, a period in which he gained international renown, was passed in teaching and research at institutions other than the Veterinary College. Even when one came to deal with his activities whilst at the Veterinary College things were not easy, for although Clough was *persona grata* with veterinary surgeons from the purely professional point of view, he was of a retiring disposition and few had access to his private life.

We did know that he lived at Highgate, his home life was a happy and contented one, he was a man who cared little for the gay side of social life, and that except for occasional visits to student functions, or Veterinary or Chemical Society meetings, he spent his off-duty hours by his own fireside with Mrs. Clough, his books and his cigarette or pipe. Such was the tubby man that we at the Veterinary College all learned to respect, for he was a great scholar, and to love, for he was gentle and kind.

He was born at Barlaston in Staffordshire on December 1, 1881, being the eldest son of the late J. W. Clough. He attended Alleyne's Grammar School at Stone and, judging from the prizes he obtained, was a good scholar. He was head boy in 1896-98.

He proceeded to Birmingham University and studied chemistry under Prof. G. Frankland, obtaining his B.Sc. degree in 1902. He graduated with first-class honours. After a short period on the staff of a school at Saffron Walden,

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PROFESSOR GEORGE W. CLOUGH, D.Sc.

he joined the staff of the Chemistry Department at Birkbeck College, London. Here he remained for the next eleven years, to establish a world-wide reputation as a research worker and as a brilliant teacher. Birkbeck people say that he was unmatched in the history of the College, for no teacher had greater success in preparing students for examination. He also gained this reputation when with us at the Royal Veterinary College. His lectures were not text-book abstracts, but lucid and interesting expositions of the essential principles and facts of chemistry. Like all great teachers, his lectures may have appeared to be deceptively simple, for being the complete master of his subject he needed little or no expensive apparatus and none of the showmanship that sometimes passes for skill in order to demonstrate and drive home his lecture points. He would interpolate snatches of a subtle, dry humour, and he gained the admiration and respect of his pupils as a man and as a teacher.

It must be remembered that Dr. Clough was a man of international fame before he came to the Veterinary College and, in that institution, although he entered upon an almost entirely different sphere in the world of chemistry, he gained another international reputation as a veterinary chemist.

In his Birkbeck days records of his first researches were published in the *Journal of the Chemical Society* for the year 1906. In this paper he identified, with great neatness and skill, the different products of reactions of benzophenone chloride with α and β naphthols. This was an original and isolated piece of work, but thereafter he directed his researches mainly towards the solution of one fundamental and exceedingly difficult stereochemical problem. This work was commenced by a very active collaboration with Prof. Alexander McKenzie, F.R.S., who went to Birkbeck College from Birmingham in 1906. Between 1908 and 1913 they were the joint authors of six of the first papers, in which Prof. McKenzie and his colleagues reported important studies on the chemistry of the Walden Inversion.

In 1892, P. Walden had found that an optically active compound could sometimes be converted into its antipode by means of substitution reactions and not by way of the racemate. This was a most unexpected and surprising observation in the light of the sterochemical ideas of that time, and it stimulated a vast amount of research, which still continues, for it cannot be said that the precise nature of this phenomenon has been solved. Walden's observation raised two important questions in the minds of research chemists. Since two different substitutions are always required for proof of a Walden Inversion, at which substitution does the change of configuration take place? And what conditions determine whether or not inversion shall take place? Many workers, including McKenzie, G. Senter and their colleagues at Birkbeck, were able to show that the structures of the groups attached to the asymmetric carbon atom, the nature of the substitution reagent, the solvent and the temperature were among the internal and external factors which promoted or inhibited the Walden Inversion. Now Clough realised that in order to obtain an indisputable answer to the first question it was essential to know with certainty the relative molecular configurations of at least all the optically active compounds likely to be employed in studies of the Walden Inversion.

He set himself the task of determining the relative configurations of a series of optically active α-hydroxy, α-amino and α-halogen substituted organic acids. This was an intrinsically fundamental stereochemical problem quite apart from its importance for the elucidation of the Walden Inversion, and it was

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already being attacked by purely chemical methods. Such methods gave unequivocable results where changes in the links to the asymmetric carbon atom were not involved, but Clough was able to show that optical methods also gave reasonably reliable results and moreover could indicate the probable molecular configuration of an optically active compound where chemical methods were not applicable or gave doubtful results.

Clough measured the rotatory powers of many optically active hydroxy, amino and chloro acids and their esters under varying conditions of solvent, concentration and temperature, and for polarised light of different wave-lengths. In particular, he made an extensive study of the effects of strong electrolytes on the rotary powers of these compounds, and his work still ranks pre-eminent in this special field.

From his observations on a series of acids of known relative configurations, Clough was able to show that the optical rotatory powers of similarly constituted compounds possessing the same relative configuration are in general influenced similarly by changes in the external conditions and also by the introduction of the same substituent into a given radicle attached to the asymmetric carbon atom. Then, by application of this rule to his own optical measurements and to those of others, he was able to indicate the probable relative configurations of many optically active organic acids of the types mentioned above. One noteworthy conclusion, which has since been amply confirmed, was that all naturally occurring α-amino acids are configuratively similar to one another and to such hydroxy acids as *d*-lactic acid and *e*-tartaric acid. They are therefore stereochemical descendants of *e*-glucose. The fact that all naturally occurring α-amino acids have the same spatial configuration with regard to the asymmetric carbon atom is of special interest to biologists, for it strongly suggests that a single primary mechanism is concerned in the natural synthesis of α-amino acids.

From 1913 onwards, Clough reported his researches independently in a series of papers communicated to the Chemical Society. His work at Birkbeck culminated in his magnum opus, published in 1918. In this paper, he summarised his work on α-hydroxy acids, α-amino acids and their derivatives. Drawing widely upon the work of others also, he presented consecutive and closely-reasoned arguments in support of his conclusions as to the relative molecular configuration of these compounds. Later he effectively answered attempted criticisms of his work. The degree of D.Sc. had already been conferred on Clough by his Alma Mater, and the publication of 1918 set the seal on an international reputation as an outstanding worker in his chosen field of research.

Dr. Clough left Birkbeck College at the end of 1916, and thereafter, although his work lay in a different field, he never lost interest in his original line of research. Soon after he came to the Veterinary College he found an opportunity to return to the subject and, with the aid of research grants from the Government Grant Committee of the Royal Society, he published two more papers, in 1925 and 1926, in which he reported new observations and confirmed earlier conclusions.

He left Birkbeck College to become head of the Chemistry Department at Blackburn Municipal Technical School, a post which he held for a little less than two years, and then he spent a similarly short period in the Wilton Research Laboratories, where he worked mainly on dyestuffs. In 1920, the appointment at the R.V.C. fell vacant owing to the retirement of Dr. G. D. Lauder. Clough

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was appointed in his stead and took up the duties of Professor of Chemistry and Toxicology. Toxicology was a new sphere of knowledge and inquiry, but it at once presented a great attraction to Clough. Within a few years he had established himself as a leading authority and one worthy to follow his predecessor. He had little opportunity to carry out controlled experiments on living animals, but he worked energetically and enthusiastically with practitioners and his colleagues in the College in solving their toxicological problems. He soon built up a fund of knowledge and gained a wide experience of the effects of various poisons on domestic animals. He published 20-25 articles in the Veterinary Press and was frequently in request as essayist at professional meetings. His services were also in demand in the Law Courts, and he gained the reputation of being a reliable and fair expert witness. He never exaggerated. He gave his evidence in a quiet, modest manner, and so he always claimed the respect and attention of the court. Those who knew his laboratory in the old College will remember the quiet methodical way he went about his work, every now and again retiring to his office, which had a large hole in the ceiling, a leaky roof and an unstable floor, to enter brief notes in the little black book. These same notes at a later date would blossom forth in a full-scale report which would stand any criticism. I have memories of he and Old George the cowman, who was also his laboratory attendant, carrying on conversation and argument as the investigations proceeded. George would every now and again offer some suggestion as to apparatus, etc., and his remarks would receive due attention. Clough seemed to have a genius to short cut an investigation. He would handle a material in his fingers, smell it, taste it, and as a result could often give you the final answer in a few minutes, and so short cut a series of complicated investigations. He seemed to be able to get to the right poison group, and often the specific poison, by an intuition which was nothing less than marvellous. In this highly technical work he seemed to be able to make do with the simplest of apparatus. He would consult freely with his veterinary colleagues, especially with Prof. Macqueen, and so in course of time he acquired the complete veterinary atmosphere or bias. In his youth he had been a hockey player of county class, and he took a great yet unobtrusive interest in the students' sporting activities.

It was a great regret to us all when we heard that he had tendered his resignation. He was not happy under the evacuation conditions prevailing at the time. The ovation given to him by the students on the occasion of his last lecture will long be remembered, and whilst it was a great tribute to a well-loved teacher, it was also a measure of the regret we all felt at his departure.

No doubt he was ill at the time, for it was not long before he began to show signs of ill-health. He fought his illness with great courage, but alas it was a losing battle, and he passed away in Highgate Hospital on February 20, 1944.

We shall all miss him greatly, and especially so those who passed through his hands at the R.V.C., for his interest in their welfare continued after they had passed through the chemistry department. We shall miss his kindly greeting: "Well! Well! It's Mr. . . . how are you getting on?"

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Reviews

Index of Diagnosis for the Canine and Feline Surgeon. By HAMILTON KIRK, M.R.C.V.S. Second edition. London: Baillière, Tindall & Cox. Pp. vii + 587. 302 illustrations. Price 35s.

THE author can feel justly gratified that a second edition of this book has been called for five years after first publication. This is all the more remarkable when one realises that veterinary books have a limited public and owing to the circumstances of war canine and feline practice has been overshadowed by work concerning the animals of purely economic value to the State.

This edition is basically a reprint of the previous work, but it is considerably increased in length and in the number of illustrations. Some sections have been enlarged and amplified and new material added on such subjects as black tongue, cramp and Stuttgart disease.

That on Stuttgart disease and cramp are particularly welcome and will tend to straighten out the confusion of ideas which have became most confounded in recent times. For those who appreciate "tabulation" there are numerous interesting tables dealing with the vexed question of differential diagnosis.

Diagnosis depends upon the correct interpretation of signs and symptoms and this book will be of great assistance in this respect, but diagnosis is not the "Be all and end all of things," and although the author promises a future volume on therapeutics the book would be of enhanced value if a little more direction as to treatment had been included in the text.

Considering the difficulties of war time, the publishers are to be congratulated on their part of the effort, with the exception of certain of the X-ray prints. One cannot guarantee to produce good prints even from the best of X-ray negatives, and one wonders why the author thought fit to insert such illustrations as Figs. 164, 173, 247, 298.

As most of the X-ray pictures are intended to depict typical abnormalities, would it not be better to illustrate these by line drawings drawn from the original films?

A tremendous amount of work and time must have been necessary in order to compile such a book, for it is almost an encyclopædia, and the result is a credit to the author.

We can recommend the book with confidence to all who would wish to graduate from the era of rule of thumb and spot diagnosis to that which is based on a logical interpretation of signs and symptoms which are manifested to those who have eyes that see.

The Perfect Follower. By HENRY HIGGINSON. A hunting tale of two continents. Published October 9, 1944, by Collins, 40, William Street, London, W.C.2. Price 6s.

A GRAND story which should appeal to all "Followers." The story revolves around Jack Meredith, who must have been a man to gladden the heart of all masters and hunt servants, and also one at whose feet the ordinary follower could sit and learn. His hunting experiences in England and America are full of the lore of the hunting field and are rounded off with just that touch of romance which gives a book a flavour. To my mind the author has done well to focus attention on the hound, a subject which is too often neglected in books of this type. Hounds are the "King Pin of Hunting," for without hounds and a deep and intimate understanding of their ways there would be no hunting.